

On the classification of some little-known Paradoxosomatidae from Java and Sumatra (Diplopoda, Polydesmida)

by

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With 20 figures

ABSTRACT

This paper gives redescriptions of some Paradoxosomatidae of the tribe Orthomorphini described by Carl, 1902, viz., *Orthomorpha zehntneri* Carl, *O. bipulvillata* Carl, *O. coriacea* Carl, *O. armata* Carl, and *Strongylosoma subalbum* Pocock, 1894, *sensu* Carl. For *O. bipulvillata* the monotypic genus *Diglossosternum* nov. gen. is proposed. *O. coriacea* and *O. armata* are referred to the new genus *Nesorthomorpha*, which contains also *Strongylosoma atroroseum* Pocock, 1894. The material described by Carl under the name of *Strongylosoma subalbum* Pocock is considered to represent a new genus and a new species: *Sphalmatogonus carli*.

INTRODUCTION

In a previous paper (JEEKEL 1968) I gave a classificatory outline of the family Paradoxosomatidae in which three subfamilies and twenty tribes were recognized. On a generic level many new categories were tentatively distinguished, but in most cases the formal proposal of new generic names was deferred owing to the lack of sufficient information required for a proper characterization of these genera.

In the course of recent years new data have accumulated permitting an evaluation of some of the species groups, and the time has come to formalize their status by taking the necessary nomenclatorial steps.

The present paper treats a number of species of the tribe Orthomorphini preserved in the Museum d'Histoire Naturelle at Geneva, which were originally studied and described by J. CARL (1902). The examination of the type-material of these species necessitates the erection of three new genera, viz. *Diglossosternum* nov. gen., for *Orthomorpha bipulvillata* Carl, 1902, from Java, *Nesorthomorpha* nov. gen., for *Orthomorpha coriacea*

Carl, 1902, and two closely related species likewise from Java, and *Sphalmatogonus* nov. gen., for the species formerly identified by Carl, 1902, as *Strongylosoma subalbum* Pocock, 1894, from Sumatra. Pertinent diagnoses and drawings are given herewith, and the opportunity is taken to give some additional information on *Orthomorpha zehntneri* Carl, 1902.

SYSTEMATIC PART

TRIBE ORTHOMORPHINI Brölemann, 1916, char. emend. Jeekel, 1968.

In 1968 the following genera were referred to this tribe: *Antheromorpha* Jeekel, 1968, *Dajakina* Jeekel, 1963, *Eudasypeltis* Pocock, 1895, *Gigantomorpha* Jeekel, 1963, *Orthomorpha* Bollman, 1893, and *Piccola* Attems, 1953, as well as some preliminarily defined, unnamed generic categories. To these must be added the more recently proposed genus *Luzonomorpha* Hoffman, 1973, erected for the group of Philippine species previously referred to *Orthomorpha*.

Although in the present concept the tribe is a fairly homogeneous one, there appear to be two groups of genera which can be distinguished on account of the presence or absence of a laminate or styliform process arising about halfway the lamina medialis of the tibiotarsus of the male gonopods. To the group in which this process is present belong *Antheromorpha*, *Dajakina*, *Gigantomorpha*, and the new genera *Diglossosternum* and *Nesorthomorpha*; the other group consists of *Eudasypeltis*, *Orthomorpha*, *Piccola*, and *Luzonomorpha* and *Sphalmatogonus*.

Orthomorpha Bollman

Paradesmus De Saussure, 1859: 325.

Orthomorpha Bollman, 1893: 159, 196; JEEKEL 1963: 261; JEEKEL 1964: 359; JEEKEL 1968: 45, 56, 67; JEEKEL 1970: 289; HOFFMAN 1973: 362.

The current concept of this genus was initiated in my paper of 1963 and elaborated subsequently in 1964 and 1968. Since then HOFFMAN (1973) has thrown some light on the formerly insufficiently known group of species occurring in the Philippine Islands and reallocated these in the genus *Luzonomorpha* Hoffman. He also added a new species from Singapore, *Orthomorpha murphyi* Hoffman, 1973, which he correctly associated with the *karschii*-subgroup of group A in my 1964 analysis of the genus.

In this analysis I distinguished some species as group D which were supposedly characterized by the absence of the demarcation between the femoral and postfemoral parts of the gonopod femorite. The three species of this group, *O. bipulvillata* Carl, 1902, *O. butteli* (Carl, 1922) and *O. sericata* Jeekel, 1964, were treated under couplets 2 and 3 of the key to the species (JEEKEL 1964: 362). Examination of the type material of *O. bipulvillata* has shown that the particular demarcation is actually present in this species, having either been overlooked or considered of no importance by Carl. Therefore, *O. bipulvillata* was misplaced as to group, but additional evidence has shown also that it has to be removed from the genus *Orthomorpha* altogether.

In the cited key *Orthomorpha zehntneri* Carl appears under couplet 6 and is opposed to *O. coarctata* (De Saussure, 1860). The re-examination of *O. zehntneri* gives the opportunity to extend its description and to substantiate the differences with *O. coarctata*.

Orthomorpha zehntneri Carl

Orthomorpha zehntneri Carl, 1902: 584.

Material. — The type-series of this species in the Geneva Museum consists of a fairly large number of ♂ and ♀ specimens of which a ♂ cotype has been re-examined. Unfortunately, the provenance of the material, as well as that of some of the other species described by Carl in the cited paper, is not better specified than "Java". It is known, however, that the collector, Dr. L. Zehntner, worked on Java at Passuruan between 1894 and 1897, at Kagok-Tegal between 1897 and 1900, and at Salatiga from 1901 onwards (Dr. B. Hauser, personal communication). Considering the year of publication of Carl's paper it seems likely that the material was collected either at Passuruan (E. Java) or at Kagok-Tegal (C. Java) and was subsequently deposited in the Geneva Museum by the collector when he was on leave in Switzerland.¹

The museum has also a microscope slide with a gonopod, but the specimen from which this was taken could not be located.

The following notes and drawings may supplement Carl's description.

Width. — 2.2 mm.

Head and antennae. — Pubescence of clypeus and frontal region moderate to sparse. Antennal sockets separated by $\frac{7}{8}$ ths of the length of the 2nd antennomere. Vertigial sulcus rather deeply impressed, running downward to just below the upper level of the antennal sockets. Antennae rather short and moderately stout. Antennomeres of almost equal length; their relative length: 2nd > 3rd > 4th = 5th < 6th, the 6th antennomere about $\frac{4}{5}$ ths of the length of the 2nd.

Collum. — (fig. 1) Wider than the head, the dorsal outline subsemicircular. Posterior border widely emarginate in the middle, a little convex more laterally and straight or even faintly concave at lateral side. Collum transversely convex with the lateral sides only slightly flaring. Lateral border widely rounded towards the latero-posterior edge which is about rectangularly acuminate. Lateral marginal rim rather narrow, the premarginal furrow ending just in front of the posterior margin, fading away gradually towards the anterior margin. Surface of collum smooth and polished with some inconspicuous hairs along the anterior margin and in the middle of the surface.

Paranota. — (fig. 1-2) Second somite a little wider than the collum, the 3rd and 4th as wide as the 2nd, the 5th a little wider than the 4th. Paranota of middle somites horizontal. The marginal calluses also ventrally well demarcated; the pores lateral near the lower side of the callus.

Sternites and legs. — Sternite of middle somites slightly longer than wide. Cross-impressions distinct but not deep, the longitudinal impression furrow-like. Sternite of 5th somite with a thick process directed obliquely forward and downward, distinctly projecting in front of anterior margin of sternite, its width about $\frac{5}{7}$ ths of the width of the sternite between coxal bases. End of process truncate, with a deep and narrow medial incision almost down to the middle. Anterior surface with rather long hairs. Caudal of process a weak transverse furrow, and behind it a deep and wide longitudinal excavation. Sternite of 6th somite deeply excavate between coxal sockets, but with a small rounded inflation between the posterior coxae. Sternite of 7th somite with a low protuberance on each side of the gonopod aperture. Legs with tibial and tarsal scopulae which are

¹ For biographical data on Dr. L. Zehntner reference may be made to a most readable account by B. HAUSER, 1972. Leo Zehntner: La saga d'un savant suisse. *Musées de Genève* 127: 2-5.

gradually thinning out towards the caudal end of the body, those of the tarsi eventually disappearing in the legs of the 15th somite. Relative length of podomeres: 3rd $>$ 6th $>$ 5th = 2nd $>$ 4th; the 6th podomere two times as long as the 5th.

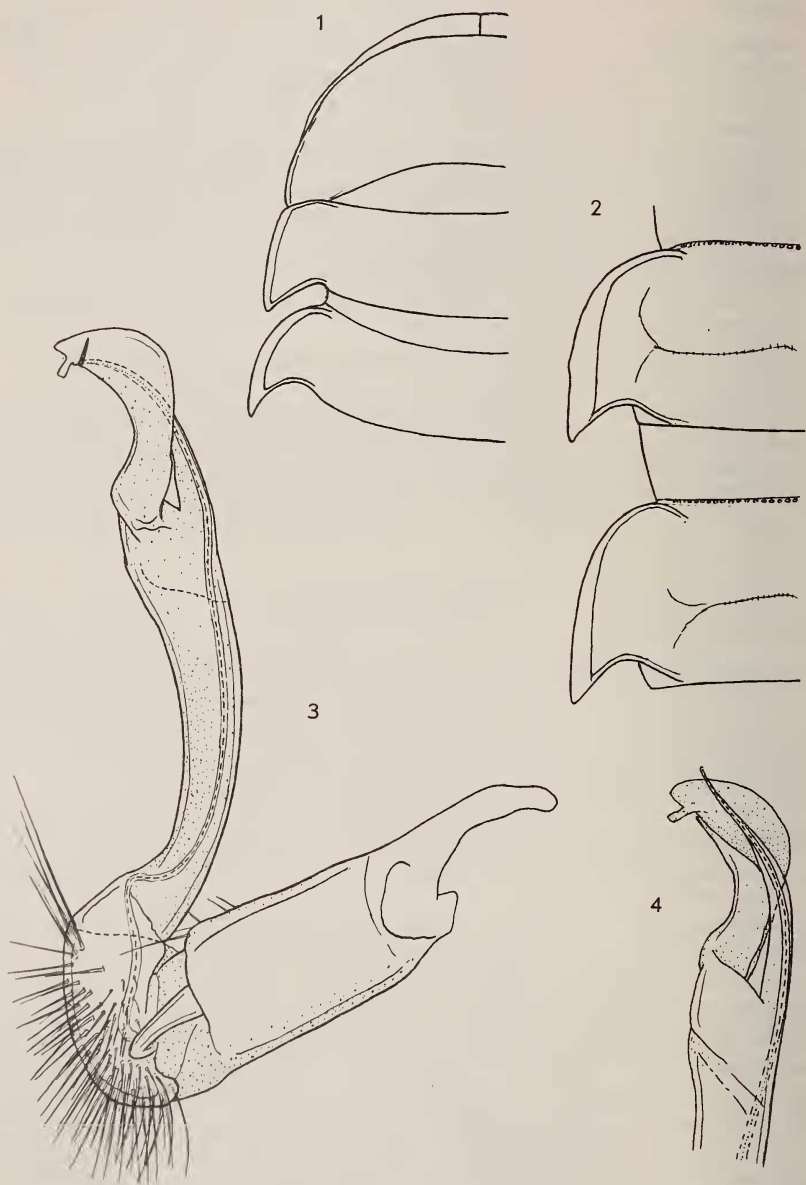


FIG. 1-4.

Orthomorpha zehntneri Carl, ♂ cotype. 1: left side of collum and 2nd and 3rd somites, dorsal aspect; 2: left side of 10th and 11th somites, dorsal aspect; 3: right gonopod, medial aspect; 4: left gonopod, apex of telopodite, lateral aspect.

Anal somite. — Epiproct very thick dorsoventrally with upper profile convex. Sides weakly converging, with small but distinct preapical tubercles. The end sub-bifurcate with a pair of acuminate cones. Hypoproct trapezoidal.

Gonopods. — (fig. 3-4) Of the usual type in the genus. The end of the lamina medialis of the tibiotarsus with the typical subquadrate preapical lappet, the apex rather shortly rounded, not bifid. Solenomerite and tibiotarsus comparatively short, the lamina medialis rather broad.

Remarks. — This species at first glance looks very much like *O. coarctata* (De Saussure, 1860), but is easily distinguished from that species by the relative proportions of the gonopod telopodite and the shape of the apex of the tibiotarsus. It is furthermore at once separated from *coarctata* by the presence of a sternal process in the 5th somite of the male.

Diglossosternum nov. gen.

Generic diagnosis. — In most characters agreeing with *Gigantomorpha* Jeekel, 1963, but distinct in the sternal modifications of the male and in the characters of the gonopods. Sternite of the 4th somite with a process in addition to the usual process between the anterior legs of the 5th somite. Gonopods of the general Orthomorphine type, with the spermal channel running along a crestlike ridge connecting prefemur and femorite (in *Gigantomorpha* there are two parallel crests). Division of femorite into femur and postfemur distinct. Tibiotarsus and solenomerite relatively shorter and more erect than in *Gigantomorpha*. Lamina medialis of tibiotarsus with a well-developed preapical lamella; lamina lateralis distally produced into a lanceolate process.

Type-species. — *Orthomorpha bipulvillata* Carl, 1902.

Remarks. — Formerly (JEEKEL 1968) the type-species was referred to the genus *Orthomorpha* Bollman, 1893, an allocation based mainly on the available evidence concerning the gonopods. Re-examination of the type-material, however, has revealed some essential characters indicating that the species is rather remotely related to the genus *Orthomorpha* in its restricted sense. Actually, *D. bipulvillatum* shares a number of characters with certain species of *Gigantomorpha* Jeekel from Borneo and Celebes suggesting a relationship with this genus. On the other hand, the differences as indicated above seem to be of sufficient importance to warrant a separate generic status. It is of historical interest to note that apparently Carl sensed the isolated position of the species when he labelled the type-material in the collection with an in litteris subgeneric name. So far the genus is monotypic.

Diglossosternum bipulvillatum (Carl)

Orthomorpha bipulvillata Carl, 1902: 586.

Material. — The type-material from Java, Dr. L. Zehntner (without further specification of locality, but see remark under *Orthomorpha zehntneri*), in the Geneva Museum consists of 4 ♂ and 1 ♀ specimens. One of the males has been selected as lectotype.

The following description and drawings were made from this material.

Width. — ♂: 4.5-4.6 mm; ♀: 4.8 mm.

Head and antennae. — Labrum rather deeply and moderately widely emarginate. Clypeus moderately impressed towards labrum, the lateral margins almost straight. Headplate smooth, somewhat polished. Pubescence of clypeus moderately dense. Antennal sockets separated by $1\frac{1}{3}$ times the diameter of a socket or by about half the

length of the 2nd antennomere. Post-antennal groove wide, rather shallow, the wall in front weakly prominent. Vertex not demarcated from frontal region, moderately globose, with a single pair of paramedian setae. Vertigial furrow sharply but not deeply impressed, running downward to the upper level of the antennal sockets. Antennae rather long, moderately stout; the antennomeres of subequal width with only the 6th slightly thicker. Relative length of antennomeres: $2\text{nd} = 3\text{rd} = 4\text{th} > 5\text{th} > 6\text{th}$, the differences slight. Pubescence moderate at base to rather dense towards apex.

Collum. — Distinctly wider than the head, subtrapezoidal or slightly sausage-shaped in dorsal outline. Anterior border straight or slightly convex in the middle, more rounded towards the sides, then straight again. Lateral border widely rounded, latero-posteriorly somewhat more narrowly. Posterior border widely concave in the middle, becoming slightly convex laterally. Surface smooth, widely convex in the middle, longitudinally as well as transversely, becoming a little more convex towards the sides. The lateral sides flaring, with the upper surface slightly transversely concave, but not raised to a horizontal level. Lateral margin somewhat incrassate but without a sharply defined rim.

Somites. — Constriction between pro- and metasomites moderate. The waist narrow, sharply demarcated from prosomite, dorsally distinctly striate down to the level of the paranota. Prosomites dull, silky. Metatergites dull, finely coriaceous. Transverse furrow present on 5th to 17th or 18th tergites, distinct but not deeply impressed, without sculpture, but mostly filled with earth particles. At the base of the paranota the furrow furcates, with branches running in various anterior and posterior directions before fading away. Pubescence restricted to some dispersed hairs on a few anterior tergites. Sides coriaceous to subgranulose. Pleural keels represented by granular ridges up to the 4th somite, completely absent from the 5th onwards, where only the lower part of the sides is somewhat inflated. An indistinct premarginal furrow runs along the caudal margin upwards to just above the middle of the sides.

Paranota. — (fig. 5) Second somite much wider than collum; its paranota sloping a little in lateral direction, and situated distinctly below the level of those of the 3rd somite and the sides of the collum. Anterior border thrust forward, the lateral borders convex, weakly diverging in caudal direction. Latero-posterior edge narrowly rounded, blunt. Marginal rim thin, not demarcated. Third somite narrower than 2nd, the 4th a little narrower than the 3rd. Paranota of 3rd and 4th somites wing-shaped, scarcely shouldered at base, with the widely rounded anterior margins passing into strongly diverging lateral margins. Paranota of 3rd somite horizontal, those of 4th flaring slightly upwards and those of 5th to 19th raised above the middorsal level. Posterior margin of paranota widely concave near base, otherwise straight. Posterior edges acute, acuminate. Anterior margin of paranota from 5th somite onwards a little shouldered at base, the lateral margin evenly rounded, without notches; the poriferous paranota similar but with a distinct notch near pore. Caudal edges of all paranota from the 2nd somite onwards projecting caudad of posterior margin of somite, those of posterior somites sharply acuminate, but not incurved. Marginal rims dorsally indistinctly demarcated, ventrally demarcated only anteriorly. Pores situated latero-dorsally at the anterior end of a triangular excavation.

Sternites and legs. — Sternites of middle somites quadrate, moderately setiferous. Cross impressions rather deep and wide, furrow-like only between two subsequent coxal sockets. Sternal tubercles near coxal sockets low, rounded, not very conspicuous, present only in post-gonopodial sternites distinct in 8th to about 12th somite. Sternal process of 4th somite rectangular, a little longer than broad, the end slightly medially incised, the width equal to $\frac{2}{3}$ of the distance between the coxae. Pubescence moderate,

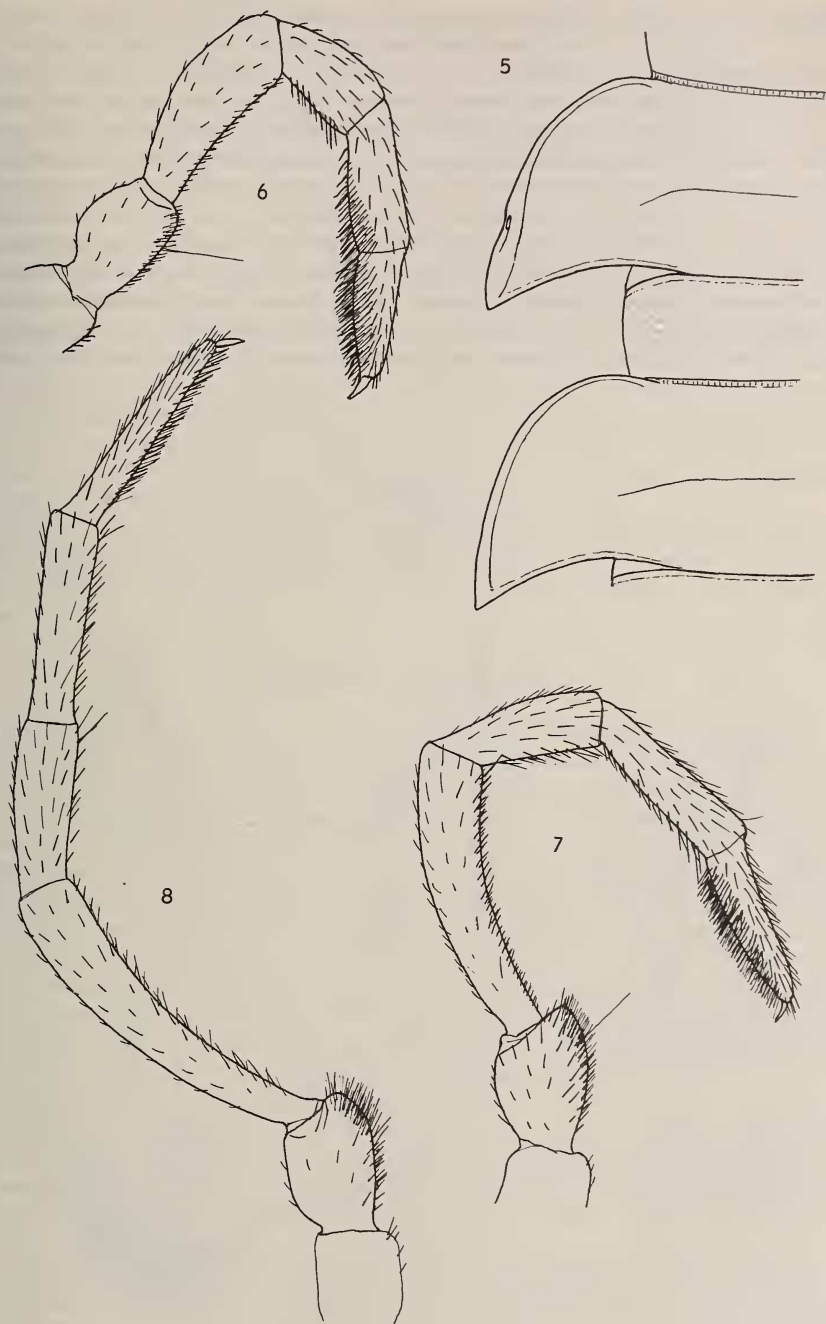


FIG. 5-8.

Diglossosternum bipulvillatum (Carl), ♂ holotype. 5: left side of 10th and 11th somites, dorsal aspect; 6: leg of 4th somite; 7: leg of 7th somite; 8: 2nd leg of 15th somite.

composed of short setae. Sternal process of 5th somite of about the same length as that of the 4th somite but narrower, the apex rounded, its width about equal to half the distance between the coxae. Both processes directed ventrad and very slightly cephalad. Sternite of 6th somite deeply excavated between the coxal sockets with the middle scarcely elevated above the ventral surface of the metasomal ring. Sternite of 7th somite slightly swollen in front of gonopod aperture but without distinct protuberances. Legs (fig. 6-8) long. The prefemora ventrally more or less incrassate and ventro-distally produced, with a dense short pubescence growing thinner in the 2nd half of the body, absent in the two ultimate pairs. Anterior legs relatively stout, becoming gradually more slender towards the 2nd half of the body, the femora arched. Ventral side of femora and postfemora densely set with short setae. Tibial scopulae rapidly thinning out, absent in post-gonopodial legs. Tarsal scopulae also gradually thinning out, disappearing in the legs of the 14th somite. Relative length of podomeres of middle legs: 3rd > 5th =

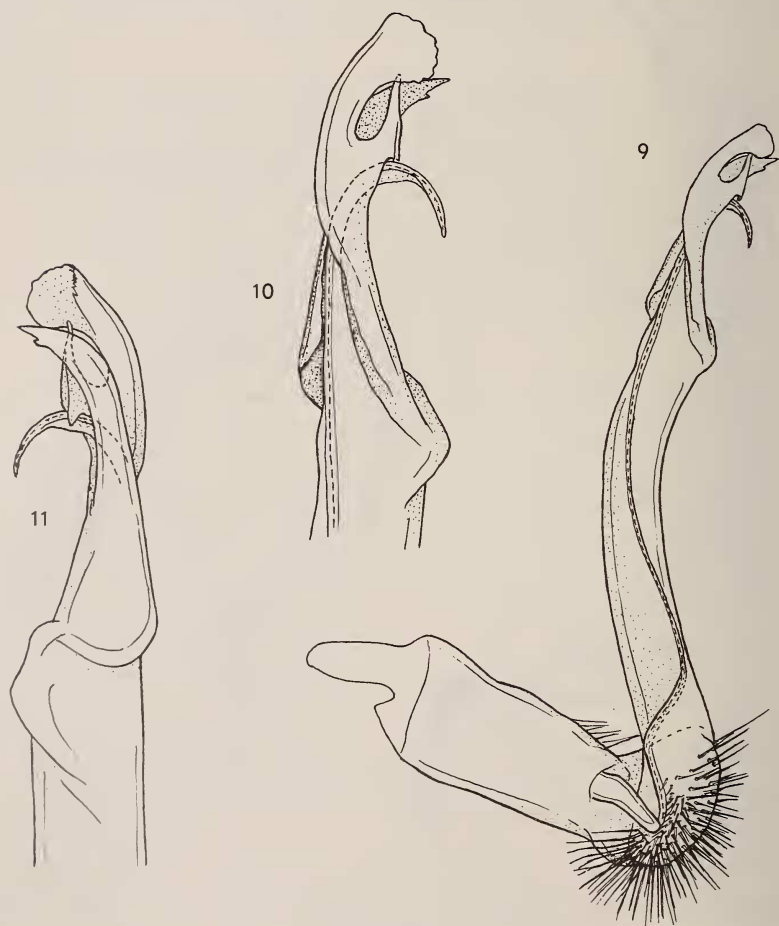


FIG. 9-11.

Diglossosternum bipulvillatum (Carl), ♂ holotype. 9: left gonopod, medial aspect; 10: apex of same, same aspect; 11: id., lateral aspect.

6th > 4th > 2nd > 1st, the 6th podomere almost three quarters of length of 3rd. Ultimate pair of legs not differing in length from penultimate pair.

Anal somite. — Epiproct rather thick and long, moderately wide. The sides almost straight converging, with two weak preapical lateral tubercles. The apex with a pair of rather small paramedian cones. Hypoproct rather long, parabolically rounded. The setiferous tubercles low, scarcely projecting caudad of margin. Paraprocts slightly coriaceous, the setiferous tubercles low and indistinct, the rim well-raised, sharply demarcated.

Gonopods. — (fig. 9-11) Coxa subcylindrical, straight. Prefemur rather short, subovoid. Femur rather long, moderately slender, widely arched in caudal direction. Postfemoral region laterally distinctly demarcated. Spermal channel running along an oblique crest towards the caudal side of the femorite and then along medial surface of femorite towards the base of the solenomerite. Solenomerite arising from medio-anterior side of end of femorite, relatively short. Tibiotarsus also rather short, directed straight distad, consisting of a solenophore only, with well-developed laminae lateralis and medialis. Lamina medialis ending in a terminally expanded lamella and an anvil-shaped process. Lamina lateralis ending in an acuminate, distally slightly notched process. Solenomerite curving between the apical parts of lamina medialis and lateralis.

Female. — Paranota less raised, projecting dorsad of middle of dorsum only in the 15th and subsequent somites. Sternites flatter. Legs slenderer than in the male, the femora almost straight. No scopulae, but femora and prefemora ventrally rather densely setiferous.

Nesorthomorpha nov. gen.

Generic diagnosis. — A genus of the tribe Orthomorphini which is probably most closely related to *Antheromorpha* Jeekel, 1968, from Burma, Siam and Indochina, but distinct from all other genera within the tribe by the presence near the base of the lamina medialis of the tibiotarsus of the gonopods of a spine-like or elongate triangular process. Apical part of tibiotarsus of gonopods deeply split into two processes, of which the proximal one conforms with the apex of the simpler type of gonopod as exemplified by *Orthomorpha*, and the distal one is a process of the lamina medialis of the tibiotarsus. Gonopods otherwise as in *Orthomorpha*, with a straight coxa of moderate length, a somewhat elongate prefemur, and a slightly curved femorite which on its lateral side shows a distinct chitinous demarcation line between femoral and postfemoral division. Course of spermal channel as in *Orthomorpha*. General structure of body similar to *Orthomorpha*, with the somites bearing well-developed paranota. Sternite of 5th somite of male with a well-developed process between the anterior legs.

Type-species. — *Orthomorpha coriacea* Carl, 1902.

Remarks. — The basic concept of this genus has already been given (JEEKEL 1963: 269) and *Orthomorpha armata* Carl, 1902, *Strongylosoma atroseum* Pocock, 1894, and *Orthomorpha coriacea* Carl, 1902, were united as group XV in a tentative outline of the status of the species of *Orthomorpha* in the old, wide sense. Later (JEEKEL 1968: 46) the group was given the status of "unnamed genus".

The genus is perhaps most closely related to *Antheromorpha*, in which the gonopod apex is similarly split into two processes, but in which the additional basal process of *Nesorthomorpha* is lacking. In *Gigantomorpha* the gonopod apex has a somewhat similar configuration, but the two apical processes are much smaller. Furthermore, *Gigantomorpha* has a differently constructed femorite which has two crests on the medial side of the basal part.

Although the gonopods of the three species of *Nesorthomorpha* are closely similar, they are easily distinguished by comparing the general morphology of the body.

Nesorthomorpha coriacea (Carl)

Orthomorpha coriacea Carl, 1902: 581.

Material. — The type series of this species in the Geneva Museum consists of a ♂ (which I have designated as lectotype) and a ♀ specimen from Java (Dr. L. Zehntner) without more precise locality or date (see *Orthomorpha zehntneri*).

The following notes and drawings may supplement, and partly correct Carl's original description.

Head and antennae. — Head without particular structural features. Antennal sockets separated by $\frac{5}{7}$ ths of the length of the 2nd antennomere. Antennae of moderate length, rather stout, hardly clavate. Antennomeres of subequal length, the 6th slightly shorter than the preceding ones. Pubescence of proximal antennomeres moderate, becoming rather dense in the distal ones.

Collum. — Lateral border rather widely rounded and without a pronounced latero-posterior edge. The lateral sides somewhat flaring, but not raised to the horizontal level, their margin narrowly rimmed. Surface with some dispersed hairs along the anterior margin and in the middle.

Somites. — Moderately constricted in the waist area. Prosomites dull, with a fine, silky structure. Waist broad, sharply demarcated from prosomite, distinctly longitudinally striate. Metatergites rather coarsely coriaceous to subgranulose in particular on the upper side of the paranota. Tergites without a sharply impressed transverse furrow, but with a weakly defined transverse impression. A transverse series of 4 setae in front of the depression and a similar series behind it. In the 2nd and 3rd somites these transverse rows consist of 8 setae, in the 4th of 6 setae. Setae rather long, but as usual partly rubbed off. Sides finely granular, their caudal border paralleled by a distinct premarginal furrow, running upwards to the level of the paranota. In the five posterior somites these furrows disappear gradually. Pleural keels present up to the 7th somite, almost obsolete on the 8th. They are represented by rounded granular crests bearing in the 2nd, 3rd and 4th somites a small caudal lappet that does not project caudad of posterior margin of the somite.

Paranota. — (fig. 12) Paranota well-developed, in most somites with widely and almost evenly rounded lateral borders. Marginal rims well-developed, bearing a hair about halfway. Pore calluses relatively short and rounded, with the pore situated in an ovoid impression. 2nd somite a little wider than the collum, the 3rd and 4th somites of subequal width, but distinctly narrower than the 2nd or the 5th. Paranota of 2nd somite about horizontal, the area at its base on the dorsal side distinctly swollen. Marginal rim rather narrow. Anterior border rounded and shouldered at base. Lateral border widely rounded, the anterior edge narrowly rounded, not angular, posterior edge obtusely angular. Paranota of 3rd somite also with a swollen area at the base, but less distinct than in the 2nd somite. Border rounded anteriorly, more widely so laterally, the latero-posterior edge about rectangular, narrowly rounded. Marginal rim thicker than in the 2nd somite. Paranota of 4th somite similar to those of 3rd, but with the latero-posterior edge obtusely angular. Paranota of 2nd to 4th somites not produced caudad of posterior margins of the somites. In subsequent somites the posterior edges become gradually more produced caudad and from about the 13th somite onwards they project slightly caudad of the posterior margin of the somite, with the edges becoming subacuminate to

acuminate in the 18th and 19th somites respectively. From the 3rd somite onwards the paranota are directed slightly upward and in the 16th to 18th somites they project above the middorsal level of the somites.

Sternites and legs. — Sternites of middle somites $1\frac{1}{3}$ times longer than wide. Cross-impressions deep and relatively wide, the longitudinal one widest. No sternal cones. Pubescence moderate. Sternite of 4th somite with a deep median impression. Sternite of 5th somite with a rectangular process between the anterior legs, which is a little longer than wide. Its width equal to $\frac{5}{6}$ ths of the distance between the coxae of the anterior

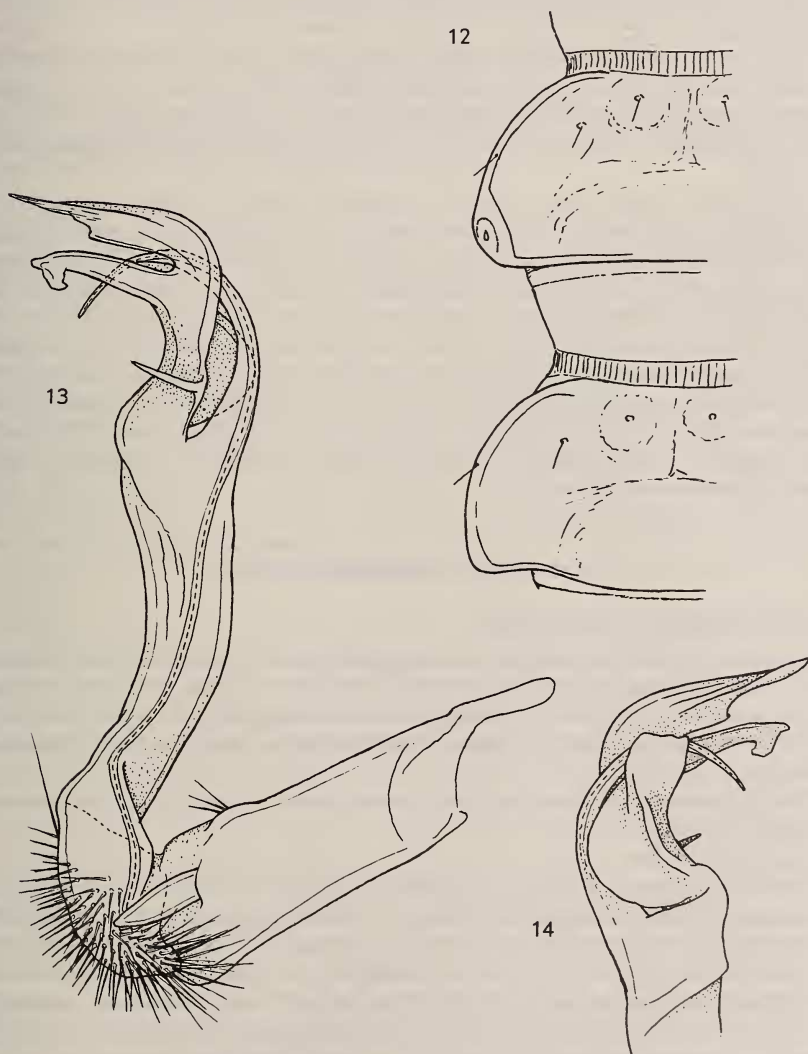


FIG. 12-14.

Nesorthomorpha coriacea (Carl), ♂ lectotype. 12: left side of 10th and 11th somites, dorsal aspect; 13: right gonopod, medial aspect; 14: apex of same, lateral aspect.

legs. Process directed downward and a little forward, the anterior side apically finely setiferous. Behind the process a transverse impression, the posterior part of the sternite deeply excavate but not down to the same level as the metasomal ring. Sternite of 6th somite deeply excavated, anteriorly somewhat less than posteriorly, and anteriorly raised a little above the ventral level of the metasomite. Coxal sockets distinctly elevated above surrounding level of sternite. Sternite of 7th somite on each side with a well-developed transverse swelling laterocephalad of the gonopod aperture. Sternite of 8th somite without particulars. Legs rather long and moderately stout, the anterior legs somewhat incrassate. Relative length of podomeres as follows: 3rd > 6th > 5th > 4th > 2nd; length of 5th podomere $11\frac{1}{2}$ ths of that of 6th. The legs in front of the gonopods have the femora slightly arched.

Anal somite. — Epiproct rather thick and broad, its sides in dorsal aspect converging practically straight, having only a slight preapical notch. Apex truncate, appearing widely emarginate through the presence of a pair of low, blunt terminal cones. Hypoproct trapezoidal in outline, the setiferous tubercles minute and not projecting outside the margin.

Gonopods. — (fig. 13-14) Coxa of moderate length, straight, laterally with a small setiferous area. Prefemur somewhat elongate ovoid, laterally distinctly demarcated from the femorite. Femorite widely curved caudad, slender and a little incrassate towards the apex. Femorite with a distinct demarcation between femur and postfemur on the lateral side. Tibiotarsus relatively small, composed of a lamina medialis and a lamina lateralis. The first has a small spine pointing caudad near the base, and more distally a laminate process shielding the proper apical process of the tibiotarsus. Lamina lateralis distally with a short rectangular lobe. Solenomerite of moderate size, tapering gradually towards the end, in its natural position sheathed by the laminae lateralis and medialis. Spermal channel running along the medial side of the femorite towards the anterior side of the postfemoral region.

Nesorthomorpha armata (Carl)

Orthomorpha armata Carl, 1902: 579.

Material. — The type-material of this species in the Geneva Museum consists of a single male specimen, the holotype, which lacks the 7th somite. There is also a microscope slide containing two unspecified legs and the telopodite of the left gonopod. The material is labelled Java (Dr. L. Zehntner) without further data (see under *Orthomorpha zehntneri*).

The following descriptive notes and drawings were made to elaborate the original description by Carl.

Width. — 2.2 mm.

Head and antennae. — Labrum moderately emarginate, tridentate. Clypeus moderately convex, its lateral margin widely convex with a slight emargination near the labrum. Pubescence moderate up to lower part of vertex. Antennal sockets separated by $1\frac{1}{5}$ times the diameter of a socket or by a little more than half the length of the 2nd antennomere. Vertex moderately convex, the vertigial sulcus fine and weakly impressed, not reaching the upper level of the sockets. Vertex with a transverse series of two plus two setae now broken off. Antennae of moderate length, the antennomeres moderately thick and of subequal length, with the more distal antennomere very slightly shorter than its proximal neighbour. 5th and 6th antennomeres slightly clavate, a little thicker than the proximal ones. Pubescence of antennae moderate basally to rather dense distally.

Collum. — Subsemicircular in dorsal outline, about as wide as the head. Anterior border weakly rounded in the middle, a little more strongly so more laterally, and laterally straight or even faintly concave. Lateral border rather narrowly and evenly rounded. Posterior border broadly and weakly concave. Lateral border finely rimmed, the premarginal furrow continued along the anterior border and fading away towards the middle. Surface almost evenly convex transversely, and only slightly flattened in the middle, smooth and polished, with a few hairs.

Body somites. — Constriction moderate; the waist narrow and finely longitudinally ribbed. Prosomites somewhat dull, with a fine cellular structure. Metatergites smooth and polished, the upper surface of the paranota slightly rugulose. Transverse furrow of metatergites deeply impressed, present from the 5th to the 18th somite, absent in the 4th, finely striolate longitudinally. In front of the furrow a transverse series of 4 setae, mostly broken off, but no granules. Sides finely granular, also in posterior somites. Pleural keels present up to 6th somite (7th somite missing!), represented by ridges which have a small caudal lappet up to the 4th somite. In the 5th and 6th somite the ridges are obsolete, and there is only the small posterior lappet.

Paranota. — (fig. 15) 2nd somite wider than collum, the 3rd narrower than the 2nd or 4th. The 5th a little wider than the 4th. Paranota of 2nd somite sloping a little and situated below the level of those of the 3rd. Anterior border shouldered at base, thrust forward a little, weakly convex; the latero-anterior edge about rectangular. Lateral border widely rounded, with a small, almost obsolete tooth anteriorly. Posterior border straight, the latero-posterior edge about rectangular, acuminate. Marginal rim narrow. Paranota of 3rd somite sloping somewhat less than those of 2nd somite, those of 4th somite horizontal. These paranota and those of subsequent somites well-developed, with anterior borders shouldered and rounded, and lateral borders almost straight and parallel to longitudinal axis of body with one notch in poriferous and two notches in poreless somites. Posterior edges acute and acuminate, caudally produced. Posterior borders almost straight, but concave at base. Marginal rims distinct, ventrally not demarcated. Porecalluses moderately thickened, with the pores lateral and a little ventral, situated at the anterior end of a longitudinal excavation. All paranota from 5th somite onwards horizontal.

Sternites and legs. — Sternites of middle somites somewhat broader than long, moderately setiferous. Cross-impressions strongly developed, with the longitudinal impression wide and concave, and the transverse furrow especially distinct between the coxal sockets. Strong pointed cones are present near the bases of all legs from the 8th somite onwards, becoming directed more caudad in the sternites of the posterior somites. Sternite of 4th somite rather widely concave between the legs. Sternite of 5th somite with a thick process between the anterior legs, about as broad as $\frac{5}{7}$ ths of the distance between the coxae. Process as long as wide, slightly broadening distally, the apex truncate and weakly medially incised. The process is directed ventrad and a little cephalad, its anterior side is covered by a dense short pubescence. Transverse furrow behind the process well impressed, the longitudinal impression is a wide excavation. Sternite of 6th somite widely transversely concave, with the middle of its anterior side slightly and the middle of its posterior side scarcely raised above the ventral level of the metasomal ring. Legs (fig. 16) of moderate length, rather stout especially the prefemora; the femora very slightly arched. The anterior three pairs a little incrassate. Relative length of podomeres: 3rd > 6th > 5th = 2nd > 4th. Pubescence moderate; tarsal scopulae visible up to the legs of the 17th somite, tibial scopulae present only in anterior legs.

Anal somite. — Epiproct broad and rather thick dorsoventrally; its sides converging almost straight, with a pair of weak lateral, preapical setiferous tubercles. The apex with

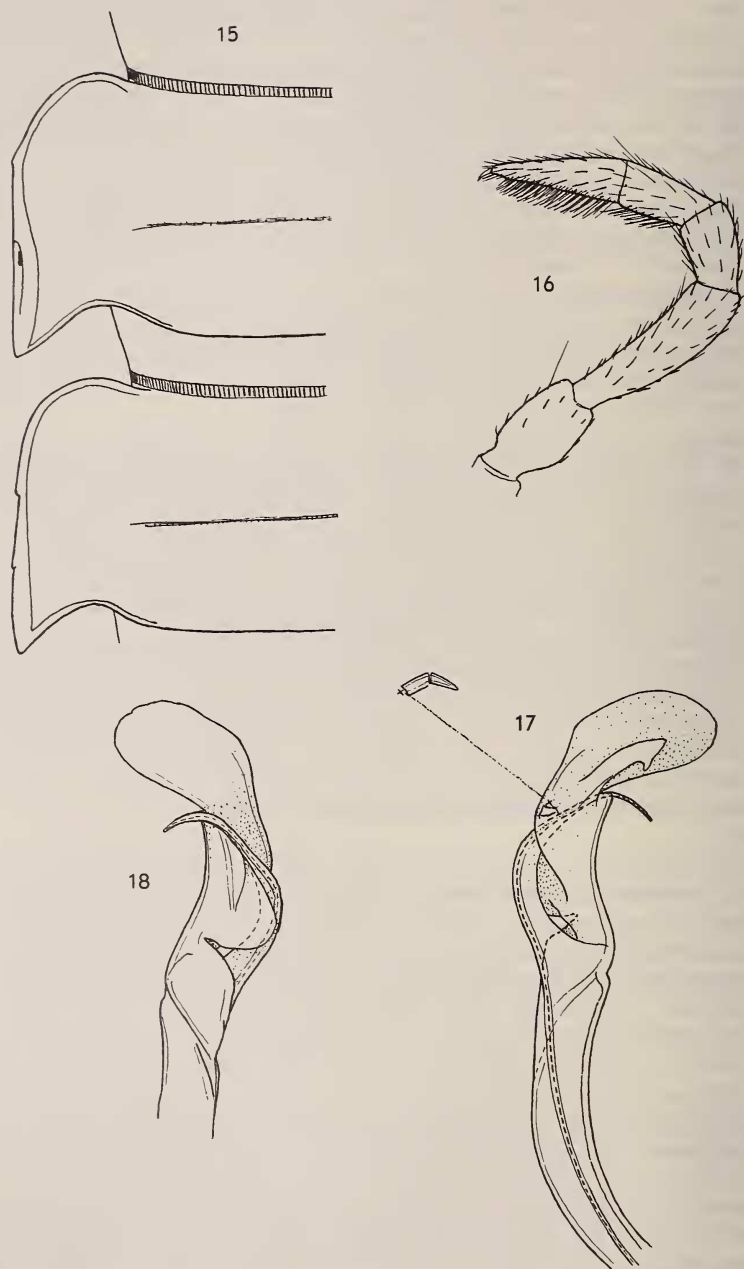


FIG. 15-18.

Nesorthomorpha armata (Carl), ♂ holotype. 15: left side of 10th and 11th somites, dorsal aspect; 16: telopodite of an anterior leg; 17: acropodite of left gonopod, submedial aspect; x. medial process of tibiotarsus broken off; 18: apical part of same, sublateral aspect.

a pair of low cones, separated by a rather wide emargination. Paraprocts with narrow, moderately high rims. Hypoproct parabolically rounded, the two setiferous tubercles low, scarcely projecting outside the margin.

Gonopods. — (fig. 17-18) Structurally similar to those of the type-species of the genus, but differing in details. The basal process of the lamina medialis of the tibiotarsus arises more distally, and the lamina lateralis lacks the rectangular lobe.

Nesorthomorpha atrorosea (Pocock)

Strongylosoma atroroseum Pocock, 1894: 368. (1)

Orthomorpha atrorosea; ATTEMS 1898: 332. (2) ATTEMS 1907: 110 (3). ATTEMS 1937: 75.

Distribution. — Java: Bogor (Buitenzorg) (1); Tjibodas (2, 3).

Remarks. — This species was originally described from a single female specimen. Subsequently, material which included males was recorded by Attems who gave a description and drawings of the gonopods. Although we cannot be sure of the specific identity of the material studied by Pocock and Attems, there seems to be little reason for doubt in the present case.

N. atrorosea appears to be most closely related to *N. coriacea*, with which it seems to agree in most of its characters. It differs in the more acute posterior angles of the paranota, the situation of the pores, the shape of the porecalluses, and the smooth surface of the metatergites. Actual examination of *N. atrorosea* certainly will bring to light more features.

Sphalmatogonus nov. gen.

Generic diagnosis. — A genus of the tribe Orthomorphini in which, contrary to the usual condition, the paranota are almost completely absent. Gonopods with coxa relatively strongly developed, the prefemur with a typical projection pointing in a proximal direction. Femorite slender and elongate, with a distinct lateral demarcation between femoral part and postfemoral part. Tibiotarsus consisting of a simple solenophore without additional processes, but with a lamina medialis and a lamina lateralis, gradually tapering to a finely acuminate apex.

Type-species. — *Sphalmatogonus carli* nov. spec.

Remarks. — It has been pointed out earlier (JEEKEL 1968: 52) that the previous allocation of the species which Carl identified as *Strongylosoma subalbum* Pocock in 1902, and which was referred to the genus *Haplogonosoma* Brölemann, 1916, by BRÖLEMAN (1916: 592) and ATTEMS (1937: 227), was incorrect. A re-examination of the material studied by Carl has confirmed that his interpretation of the gonopod was erroneous, and that he overlooked the existence of a separate solenomerite and a tibiotarsus. Since it is altogether doubtful that the material identified by Carl concerns the same species as the one described by Pocock, a new specific name is proposed.

According to the structure of the gonopods, *Sphalmatogonus* is clearly a member of the Orthomorphini. On account of the almost complete absence of paranota, one would tend to locate it near the genus *Dajakina* Jeekel, from Borneo, from which it differs, however, in the configuration of the tibiotarsus of the gonopods and by the presence of the thumb-like process in the gonopod prefemur. The latter character seems to be unique in the family Paradoxosomatidae.

Sphalmatogonus carli nov. spec.

Strongylosoma subalbum; CARL 1902: 566.

? *Strongylosoma subalbum* Pocock, 1894: 360.

Material. — The type material in the Geneva Museum consists of the ♂ holotype, the head and some somites of a second ♂, and a ♀. There is also a microscope slide containing a gonopod which probably belongs to the fragmented ♂. The locality given is Sumatra without specification or date.

As Carl identified this material with the species which Pocock had described after a female specimen, he confined himself to mentioning some points of the external morphology of the male and a description and drawing of the gonopods. Therefore, a new description and gonopod drawing have been prepared.

Width. — ♂: 1.6 mm; ♀: 1.8 mm.

Head and antennae. — Labrum moderately emarginate. Sides of clypeus straight, the clypeus itself weakly convex, rugulose, moderately setiferous. Antennal sockets separated by $\frac{7}{9}$ ths of the length of the 2nd antennomere. Vertex rather convex, the median sulcus well impressed, but not reaching the upper level of the antennal sockets. Antennae long and slender, the antennomeres of subequal length, the 2nd and 6th antennomeres slightly shorter than the 3rd, 4th or 5th.

Collum. — Narrower than the head, subreniform in dorsal outline. Anterior border almost straight in the middle, becoming widely rounded more laterally. Posterior border widely emarginate in the middle, laterally weakly convex. Lateral border narrowly rounded. Surface smooth, somewhat flattened in the middle, more convex laterally, lateral sides with a fine marginal rim.

Somites. — Constriction moderate, the waist rather broad, smooth or very faintly striate. Metatergites smooth and polished. Transverse furrow faintly present on 3rd and 4th tergites, but deeply impressed from the 5th to the 18th tergite, laterally not reaching the upper furrow of paranota, but disappearing at a distance from that furrow roughly equal to the dorsoventral diameter of a poriferous paranotum. Sides of somites smooth. Pleural keels weakly indicated in 2nd to 4th somites, absent from the 5th onwards. Stigmata of pregonopodial somites conspicuously stalked.

Paranota. — (fig. 19) 2nd somite scarcely wider than the collum, the 3rd and 4th somites each slightly wider than the preceding somite. Poreless paranota represented by a concave upper furrow, the lower demarcation almost obsolete. The upper furrow disappears anteriorly at a rather far distance from the waist. Poriferous paranota represented by slight humps dorsally demarcated by a slightly convex upper furrow, and ventrally by a slight depression in the caudal third. Pores lateral, situated in the middle of a circular excavation. Poriferous paranota rather broad dorso-ventrally.

Sternites and legs. — Sternites of middle somites $1\frac{1}{7}$ times longer than broad. Cross-impressions distinct but not deep, the longitudinal impression is a wide excavation. Pubescence rather weak. No sternal cones. Sternite of 4th somite broad and slightly impressed. Sternite of 5th somite with a long triangular process directed obliquely cephalad and downwards. At the base the process is broad and occupies the entire distance between the coxal sockets of the anterior legs. The process arises a little cephalad of the coxae of the anterior legs. Transverse impression behind the sternal process almost obsolete. The part of the sternite between the posterior pair of legs is somewhat inflated and has a pair of tufts of setae. Sternite of 6th somite also broad and inflated, without impressions. Between the anterior legs a pair of tufts of setae, and between the posterior

legs a pair of swellings each also bearing a tuft of setae. Legs long and slender. Relative length of podomeres: $3rd > 6th > 5th > 4th = 2nd$. Legs of 2nd pair with a long coxal protrusion.

Anal somite. — Epiproct of moderate length and thickness; the sides moderately converging, somewhat concave; preapical tubercles rather small, the apex truncate, without paramedian cones. Hypoproct triangular with straight sides, the posterior border rather narrowly rounded, setiferous tubercles small and projecting outside the margin.

Gonopods. — (fig. 20) Coxa rather voluminous in comparison with the telopodite, with an anterior setiferous area. Prefemur relatively small, somewhat oblique on the longitudinal axis of the femorite, medio-posteriorly bearing a very characteristic protuberance pointing proximad. Femorite relatively long and very slender. Postfemoral

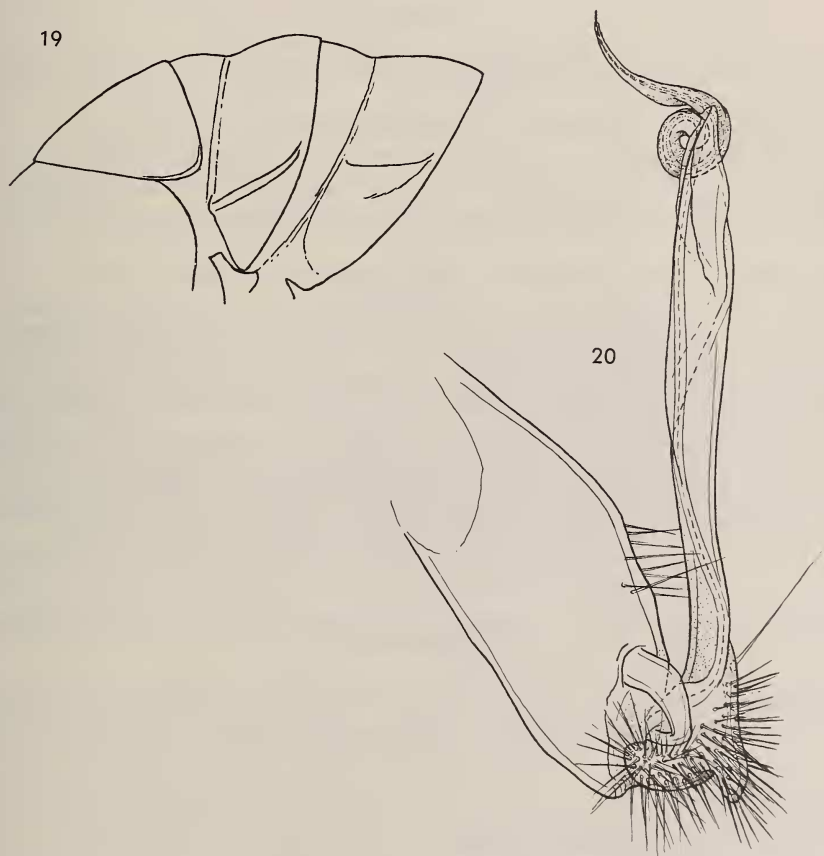


FIG. 19-20.

Sphalmatogonus carli nov. spec., ♂ holotype. 19: collum and 2nd and 3rd somites, left side, lateral aspect. 20: left gonopod, medial aspect.

section laterally distinctly demarcated. Spermal channel making a slightly sigmoid curve along the femorite towards the anterior side of its distal end from where the solenomerite arises. Solenomerite long and slender. Tibiotarsus similarly shaped with the laminae medialis and lateralis distinctly developed, directed distad, but then forming a coiled sheath around the solenomerite, tapering towards the apex without additional processes.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance of Dr. Berndt Hauser, Museum d'Histoire Naturelle, Geneva, Switzerland, in providing facilities for the study of the material in the collection under his care. The visit to the Geneva Museum in 1976 was financially supported by the "Nederlandse Organisatie voor Zuiver-wetenschappelijk Onderzoek ZWO", The Hague, Netherlands.

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